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MORE CALIFORNIA-POPPY IN STUBBLE FIELD THAN IN OLD FIELD

Raymond D. Ratliff Stanley E. Westfall Richard W. Robarts

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Abstract: The density and flowering of California-poppy *(Eschscholzia californica* var. *peninsularis* Green*)*, amount of bare ground, and occurrence of other plants were studied in an old field and a stubble field near Madera, California. The stubble field had more poppy plants per unit of area, more plants flowering, and more bare ground than the old field. The two fields differed in how often other plants were found. The results suggest that a site disturbance that produces a harsh microclimate or reduces competition or both will favor California-poppy and that this variety tends to associate more readily with certain plants than others.

Oxford: 181:176.1 *Eschscholzia californica* var. *peninsularis* 794.
Retrieval Terms: Eschscholzia californica var. *peninsularis*; site productivity; plant sociology; autecology; California.

The cup-of-gold or California-poppy *(Eschscholzia californica* Cham.*)*, has long held special interest—not only because of its status as California's State flower, but also because of its natural beauty. A result of this interest is that today much is known about the taxonomy, genetics, reproduction, seed characteristics, and garden culture of California-poppy. However, information about the impact of man's activities on this species is scarce.

Four major forms of California-poppy are commonly recognized. The "typical" plants are strongly rooted perennials from bluffs and dunes along the coast. Another perennial form has prostrate stems, and is found on the coast—mostly among sand dunes. An inland perennial differs from the "typical" by showing seasonal variation in flower color and size. This inland perennial has now largely been replaced by an annual form (var. *peninsularis* Green)—and this is the variety referred to in this note *(fig. 1)*. All of these forms prefer warm sunny exposures with good drainage. The species, in general, is found on a wide range of soil types, under diverse surface conditions, and from sea level to 6,500 feet elevation.

Several authors[1] have written that fields of California-poppy were lost to various land-use treatments, but their statements are based solely on observations. Some of these observations contradict ecological theory, and specific hypotheses will have to be tested. Lacking also are on-the-ground studies of the relationships between California-poppy and various environmental factors.

To help fill the need for such studies, we compared the density and flowering of California-poppy, amount of bare ground, and occurrence of other plants in an old field and a stubble field near Madera, in central California. We found more poppies and more bare ground in the stubble field than in the old field. And the two fields differed in how often other plants were found.

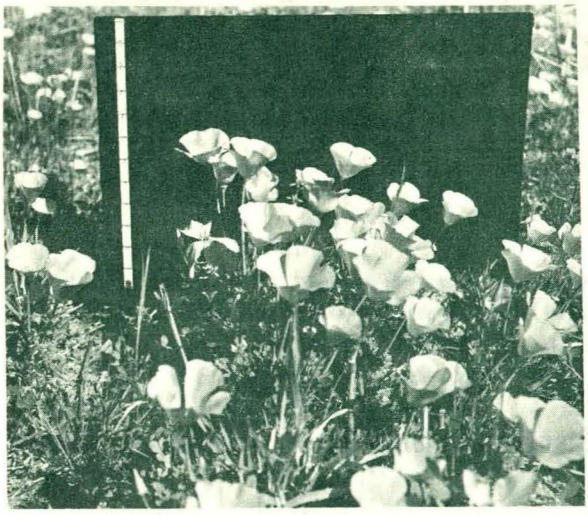

Figure 1—The variety of California-poppy studied in two fields in Madera, California is *Eschscholzia californica* var. *peninsularis* (Green).

STUDY AREAS

The old field had been used for grain production until 1962. Since then it has been neither cultivated nor grazed and has reverted to annual-plant grassland.

The stubble field has been used for grain production for many years. It was last planted to grain October 1969. The harvest aftermath was grazed by cattle from mid-June to mid-July 1970. In October 1970, the area was broadcast with crimson clover *(Trifolium incarnatum* L.*)*. No additional treatment had been applied to the time of this study–March 31, 1971.

The two fields are on opposite sides of Road 145, about 3 miles east of the city of Madera in open rolling country. The roadway crosses an old river bed at that point. Soil of the river bed (Tujunga loamy sand[2]) is noncalcareous, coarse-textured, excessively internally drained, and derived from granitic sediments. It is low in organic matter, has a low moisture holding capacity, and reaction is neutral. Soil of the bordering slopes is a Cometa sandy loam. This soil is slightly acid and well drained, but has a dense claypan in the subsoil.

In both the old field and the stubble field, poppies were nearly nonexistent on the slopes. Therefore, sampling was restricted to the area of the old river bed. The lack of poppies on the slopes may have been due to the claypan.

Table 1–*Poppy density and flowering and bare ground on an old field and a stubble field, Madera, California*

Item	Old field	Stubble field
Average poppy density. No./sq.ft.	1.9	7.3*
Proportion of plants with flowers . . . . . pct.	17.4	52.8**
Bare ground . . . . sq.cm./sq.ft.	12	269*

*Differs significantly from value for old field at 1 percent level of probability by Student's t test.

**Differs significantly from value for old field at 1 percent level of probability by chi-square test.

METHODS

We selected 10 random starting points in both the old field and the stubble field, and randomly located 10 plots along predetermined courses from each starting point. Each plot was 1 square foot. Hence, our sample of each area consisted of 100-square-foot plots.

The number of poppy plants rooted within each plot was counted. An ocular estimate of the percentage of visible bare ground was made, and the presence or absence of selected species and species groups was noted. Percentage estimates of bare ground were converted to square centimeters for analysis.[3]

In addition, the number of poppy plants flowering was recorded. This information was considered a relative measure of stand vigor. It is the large, deep orange flowers present at the time of our study, rather than the smaller yellow ones produced later, which give California-poppy its esthetic appeal.

RESULTS AND DISCUSSION

Density of poppy plants, the proportion of poppy plants with flowers, and the amount of bare ground were all greater in the stubble field than in the old field *(table 1; fig. 2)*. The old field, but not the stubble, had a heavy mulch layer.

Apparently California-poppy does not favor competition; and site disturbance, which produces a harsher microclimate, appears to favor the species. Therefore a management program which reduces competing vegetation or mulch or both may favor California-poppy.

Except for the group of "other broadleaf" species, other species differed in frequency of occurrence *(table 2)*. Ground lupine *(Lupinus bicolor* Lindl.*)*, foxtail fescue *(Festuca megalura* Nutt.*)*, common owl-clover *(Orthocarpus purpurascens* Benth.*)*, and clovers *(Trifolium* spp.*)* all had significantly higher frequencies in the stubble field. The difference between the areas for clovers was obviously related to

Figure 2—Density and flowering of California-poppy in an old field (upper) and a stubble field (lower) near Madera, California were compared on March 31, 1971.

the sowing of crimson clover. Both ripgut brome *(Bromus diandrus* Roth. formerly *Bromus rigidus* Roth.*)* and broadleaf filaree *(Erodium botrys* Bertol.*)* were apparently reduced by cultivation.

These data hint that California-poppy associates with certain species more readily than with others, and that enviromental requirements of California-poppy and its associates are similar. If this is so—where poppies are rare or do not appear—management techniques could be used to encourage the associated species and perhaps increase poppy occurrence.

Table 2—*Frequency of occurrence of plant species or groups in square foot plots on an old field and a stubble field, Madera, California*

Species or group	Old field	Stubble field
	No. of plots out of 100	
Ground lupine	5.5	17*
Foxtail fescue	72	97*
Common owlclover	27	47*
Ripgut brome	97	17*
Broadleaf filaree	68	0*
Clovers	5	95*
Other broadleaf species	94	97

*Differs significantly from value for old field at 1 percent level of probability by chi-quare test.

Our results suggest that site disturbance—in this case, past cultivation—benefits California-poppy. We know from other studies[4] that timing and intensity of grazing disturbance affects abundance of other annual-plant species. We suspect that grazing management may be a useful tool for influencing poppy abundance, but further study will be necessary to test this hypothesis. The need of such studies depends on what importance society places on the culture of California-poppy.

NOTES

[1]Clements, Edith S. *Flowers of coast and Sierra.* New York: H. W. Wilson Co., p. 16-17, 1928. Saunders, Charles F. *With the flowers and trees in California.* New York: R. M. McBride & Co. 286 p., illus., 1930. Smith, Emory E. *The golden poppy.* San Francisco: Murdock Press. 231 p., illus., 1902. White, Keith L. *Old-field succession on Hastings Reservation, California.* Ecology 47(5): 865-868, 1966.

[2]Ulrich, Rudolph, and Leslie K. Stromberg. *Soil survey, Madera area California.* U.S. Soil Cons. Serv. and Calif. Agric. Exp. Stn. Ser. 1951, No. 11, p. 23, 57; sheet 67, 1962.

[3]Dixon, Wilfrid J., and Frank J. Massey, Jr. *Introduction to statistical analysis.* New York: McGraw-Hill Book Co. 488 p., 1957.

[4]Bentley, J. R., and M. W. Talbot. *Efficient use of annual plants on cattle ranges in the California foothills.* USDA Circ. 870. 52 p., 1951. Biswell, Harold H. *Ecology of California grasslands.* J. Range Manage. 9(1): 19-24, 1956. Heady, Harold F. *Changes in a California annual plant community induced by manipulation of natural mulch.* Ecology 37(4): 798-812, 1956. Talbot, M. W., and A. W. Sampson. *The range in California.* In, *U.S.D.A. Yearbook.* Washington, D. C.: U.S. Govt. Printing Office. p. 575-582, 1948.

The Authors

are assigned to the Station's range-wildlife environmental research unit, headquartered in Fresno, Calif. **RAYMOND D. RATLIFF,** a range ecologist, earned degrees in range management at the University of California (B.S., 1959; M.S., 1961). He joined the Station research staff in 1961. **STANLEY E. WESTFALL,** a range technician, earned a B.S. degree (1960) at Fresno State College, and has been with the Station staff since 1960. **RICHARD W. ROBARTS,** also a range technician, joined the Forest Service in 1952, and the Station staff in 1966.

The Station's range-wildlife environmental research unit, headquartered at Fresno, California, is developing the scientific base for multiple-use management of central California ecosystems. This report adds a facet of knowledge for the ecosystem of the Sierra Nevada foothills.

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